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Strategic Marketing Planning, Marketing Networking and SMEs Performance: Modelling a Neural Network

***Hossein Hakimpoor[1] Naser Khani[2]**

[1]Assistant Professor, Department of Management, Birjand BranchIslamic Azad University, Birjand, Iran,
[2]Assistant Professor, Faculty of Management, Najafabad Branch, Islamic Azad University, Najafabad, Iran.

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ABSTRACT

This paper investigates the impact of strategic marketing planning and marketing networking on SMEs performance.126 SMEs participated in study. Using artificial neural network this study found the positive effect of strategic marketing planning and marketing networking on the performance and this effect is stronger when the strategic marketing planning and marketing networking dimensions effects merged.The current research identified the contribution of strategic marketing planning and marketing networking to the SMEs performance. In addition this study showcases the advantage of neural network for analyzing the nonlinear relationship and determining the simultaneous effect and importance of strategic marketing planning and marketing networking on the SMEs' performance.

KEYWORDS: Strategic marketing planning, Marketing networking, SMEs' Performance, Modelling, Neural networks.

1. INTRODUCTION

Strategic marketing planning (SMP) is a subset in strategic planning. Indeed, SMP process is related to the development of strategies that are based on the assessment of planning team of the market and perceptions of managerial expectations and organizational capability [1]. The strategic marketing concentrates on organizational performance rather than a primary involvement about rising sales. Accordingly, investigating the effect of SMP on the SMEs' performance would be very useful to help SMEs' owners /managers to improve their performance.

The strategic marketing literature first began to deal with SMEs twenty years ago. However, there is still insufficient knowledge about marketing in small business and, in particular, in relation to the understanding of strategic marketing practices [2-3]. While a number of empirical studies investigated strategic management practice in large firms [4-10], few researches have focused on this area of management in small and medium-size enterprises (SMEs) and confirmed that SMEs who strive to improve business performance should engage in performing the various strategic marketing planning process [11].

Unlike large organizations, networking is eminent for SMEs in executing the strategic marketing planning. Considering the nature of marketing activities in SMEsit has been acknowledge that networking is a useful way for SME owner/managers to support their marketing plans, refine and implement their marketing activities efficiently and eventually they can improve their firms' performance [12-13]. Nevertheless, there is limited researches on SME networking in relation with marketing activities [13]. Actually existing studies on SMEs networking tend to focus on the nature and process of marketing networks and there is very limited number of studies that investigated the relationship between marketing networking and performance (Watson [14]and its relationship with strategic marketing activities in SMEs context.

Furthermore, previous studies that have been conducted in SMP-performance have attracted criticisms including the use of a bi-variate methodology and suggest that other factors will impact on the relationship between strategic marketing planning and performance [9, 15].Indeed, using bi-variate methodology would cause to ignore the other factors that potentially affect on the SMP-Performance relationship. Accordingly, present study tries to use a multivariate methodology to have more comprehensive approach for analyzing the relationship between SMP and MN with performance.

Artificial neural networks (ANNs) were used in this study due to the judgmental nature of the input data, perceptions of managers, rather than exact observed values. Indeed in a business context there are decisional situations related to strategic issues in firms, where problems are far from being well-structured and need human judgement and analysis to assess and solve these problems with guarantees of success. Developing and applying ad-hoc intelligent systems, due to their particular strengths, to process data and provide valuable information might be of interest to managers in their decision-making [16]. Based on a basic search in Scopus the total number of papers published on business and AI/intelligent systems in business/management-focused journals is

***Corresponding author:** Hossein Hakimpoor, Islamic Azad University, End of Ghffari srteet, Birjand, Iran, Tel: 00989151614044, Email: hhakimpur@gmail.com, No: 306, main building, 9718713118.

less than 150[16]. With this special issue, using ANNsmodeling, this study aims to search for new links between strategic marketing planning (SMP) and marketing networking (MN) dimensions with performance.
Secondly, there are some research evidences that the relationship between firm performance and strategic planning is not captured adequately by linear models and more likely would be explained by modelling non-linear relationships than by modelling linear relationships [17-19]. Neural networks are particularly well suited and highly effective to pattern recognition problems where relationships are complex, and the data contained non-linear and subjective characteristics [20-21].This study investigates the relationship between strategic marketing planning and marketing networking on SMEs performance. More specifically, this study aims to answer the following questions?

1. Is there a relationship between the process of strategic marketing planning and SMEs' performance?
2. Is there any relationship between various dimensions of marketing networking and SMEs' performance?
3. What is the interactive effect of SMP and MN on the SMEs' performance?

The article is structured as follows: First, the extent literature on strategic marketing planning and marketing networking in SMEs context are reviewed. This is followed by a description of the research methods and procedures used in the study. The results of the study are then discussed. Finally, managerial implications, limitation, and direction for future research are offered.

2. LITERATURE REVIEW

Strategic planning is a method of giving the direction and aligns the firm in relation to the surrounding environment and be competitive. Besides being as a management tool in a firm, strategic planning provides preparedness and modes of response to the environment [22].In line with Gilligan and Wilson [1] strategic marketing planning process is related to the development of strategies that are based on the assessment of planning team of the market and perceptions of managerial expectations and organizational capability. Indeed, the process of SMP is similar to strategic planning but within the marketing function of the firm. Strategic marketing is a process of strategy development based on market orientation that taking into account a continuously changing business environment and the need to deliver superior customer value.

According to Carvens and Piercy [23] strategic marketing causes to building a relationship between organization and its environment and views marketing as a responsibility of the entire business rather than a specialized function. As stated by Ashil et al [24], the major weakness of the SMP literature has been a failure to examine decision maker perception of marketing planning. In small and medium sized enterprises (SMEs) context strategic marketing planning (SMP) involved with the establishment of strategies that are based on the market evaluation and perceptions of owner/manager's expectations and organizational capacity [1]. Actually, the purpose of strategic marketing planning according to Perreault et al [25], is finding attractive opportunities and developing profitable strategies that specifies a target market and related marketing mix. Armstrong and Kotler [26], stressed that a strategic marketing plan involves laying out the target markets and the value proposition that will be offered, based on the analysis of the best market opportunities. Cravens and Piercy[23] view the strategic marketing planning process as consisting of the following key steps: analysing the environment, designing a marketing strategy, formulating a marketing program, and implementing and controlling the marketing program.

Literature review revealed that the elements of strategic planning have not changed when applied to small firms versus large firms. Dimensions of the strategic planning elements have been applied to a variety of industries. For example, many of the same planning aspects applied in empirical studies of large firms have also been utilized for studies with small businesses respondents [27].

Strategic planning process contains several dimensions, e.g. formality; comprehensiveness, participation, sophistication; consistency and thoroughness [28-31]. Regarding the convergence and overlap between some of these dimensions (e.g. sophistication and formality or thoroughness and comprehensiveness) and also the much less complexity in the process of strategic planning decision making in SMEs [32], three distinct dimensions of SMP were examined as the independent variable components in this research. These dimensions are: formality, participation and comprehensiveness.

In assessing the level of formality of strategic marketing planning process two measures were employed by researchers. The first measure that has been used with a number of prior studies is the presence or absence of a written strategic plan [33]. This measure dichotomizes firms into planner and non-planners. But the formality of strategic planning process is a multi-dimensional phenomenon. Therefore, using a uni-dimensional variable to conceptualize a multi-dimensional phenomenon is inefficient. To overcome this problem researcher has to use of multiple indicators to assess how closely the element of written documentations is look like to the normative strategic planning process. Some researchers stated dimensions that define the main characteristics of the formal strategic planning process [28, 33]. After a synthesis of above literature, in this study, a mixed instrument has been decided and used to determine the level of formality of strategic planning process within the marketing

function of SMEs. Accordingly, in this research the level of the formality of planning was measured based on elements included: existence of explicit goal setting; long-range and written planning; specifying the responsibilities and assigning implementation responsibilities to specified individuals; level of commitment to long-range plan; budgeting based on market segments; reviewing the performance against the budget.

The next dimension of SMP process that has been used in this study is comprehensiveness. The comprehensiveness has identified as "the extent to which an organization attempts to be exhaustive or inclusive in making and integrating strategic decisions" [29].Academics believe that comprehensiveness is the extent to which an organizations key decision makers have tendency to use an extensive process for decision making that includes high level of investigation to developing alternatives courses of action, evaluating alternatives and developing multiple criteria to screen alternatives[30-31, 34-35].

Reviewing the literature, there are some measures that have been used by researchers for measuring the comprehensiveness (e.g. Atuahene-Gima and Li, 2004; Forbes, 2000; Goll and Rasheed, 2005; Papadakis and Barwise, 2002). Considering the common measures in literature the level of planning comprehensiveness was determined in terms of the following criteria: using experiences from a number of management levels; using divers set of ideas that include a number of internal and external sources of ideas, rather than limited internal sources; evaluating thoroughly each possible action before marketing planning; attempting to determine optimal courses of action from identified alternatives in marketing planning.

Participation is the other important component of strategic planning process. Although, the major responsibility of an organization's owner or chief executive officer is making good strategic decision, both managers and employees must also be involved in all activities of strategic management process. Actually, participation is a key to gain commitment for needed changes (David, 2010). According to Grover and Segar (2005) participation contains the extent of involvement in SMP, or variety of individuals involved in SMP (Papke-Shield et al, 2002). In line with Ketokivi and Castaner (2004) participation in the strategic marketing planning process can generate informational, affective and emotional effects. Indeed, in a participative strategic planning process, top management usually forms a number of teams of employees from different units and hierarchical levels in order to analyze the implementation of past strategies and the organizational environment and to propose goals, as well as strategies, and budgets for achieving those goals. Participation in decisions as the extent to which lower level managers participate in the organization's strategic decision making processes and thereby influence the organization's strategic outcomes (Andersen, 2004).

The participation level for this study was assessed based on the level of influence from two dimensions that had been validated in earlier research by Phillips (1996) and Phillips et al (2001) and Papke-Shield et al (2002). First dimension is the level of influence that differing staff levels exert on the strategic marketing planning process. Second dimension is the level of influence that differing functional areas exert on the strategic marketing planning process.

Although, it is generally accepted that small businesses are not big businesses that scaled-down or smaller versions of larger firms [36]. Rather, they are a heterogeneous group of businesses that have their own unique characteristics which largely determine their marketing activities and concerns and differentiate them from conventional marketing in large organizations[37].

Because of limited resources and limited impact on the marketplace and a lack of specialist expertise in SMEs, traditional marketing theories are no longer applicable to them and following the traditional route of marketing is hampered for SMEs marketing [38]. In contrast, SMEs have natural capabilities that enable them to practice effective marketing through networks. Recent research implies to networking as a mean through which SMEs may successfully conduct their marketing activities. In other word, SMEs marketing decisions can be enhanced through networking[38].

SME owners-managers can utilize networking to support their marketing plans, refine and implement their marketing activities efficiently and eventually they can improve their firms' performance in a competitive marketplace (Gilmore et al, 2006). Furthermore, Networking is used by managers to make sense of what happens in complicated markets and provides understanding of inter-organizational relationships in business-to-business markets [39]. Networking can be an important business dimension given the resource constraints and limitations SMEs work within [37]. This is especially true in relation to the marketing decisions of SMEs, as owner/managers recognize the need to utilize their limited resources more effectively to compete with increasingly powerful competitors.

While there are many factors that can influence the success of a venture, only recently researchers have begun to highlight the potential significance of an owner–manager's networking involvement [40]. There are a limited number of studies that have documented a positive association between networking and various aspects of performance [41-43]. Watson (2007) in his work on marketing networking and firm performance states that (after allowing for age, industry and size of business) networking appears to be significantly positively associated with firm survival and, to a smaller extent, growth. Accordingly, it seems to be a good opportunity to have a closer look at the relationship between marketing networking and SMEs performance. Four integrated dimensions of MN that previously have been developed [44]are: marketing networking intensity (MNI);

marketing networking strength (MNS), marketing networking proactivity (MNP); and marketing networking diversity(MND).

Marketing networking intensity (MNI) shows SME owner-managers tendency to use marketing networks in doing marketing. This dimension has resulted from integration between "level of networking" (O'Donnel, 2004), "Usage dimension" (Carson et al, 2004) and "marketing intensity" (Danis, 2010). To assess this dimension eleven items were used. These questions are resulted from previous researches that have conducted in this area (e.g. Danis, 2010; O'Donnel, 2004; Carson, 2004).

Marketing networking strength (MNS) shows the strength of linkages between owners/managers and network actors and was measured in term of level of trust, commitment and co-operation between owner-managers and network actors (Carson et al, 2004; O'Donnel, 2004). The third dimension of MN is marketing networking proactivity (MNP) that indicates the extent of reactive or proactive networking in which owners/managers engage with particular actor in marketing network (O'Donnel, 2004; Gilmore et al, 2006). Marketing networking diversity (MND) shows the number and varietyof network sources that an SME owners/managers uses in doing marketing (Carson et al 2004). This dimension refers to structural dimension of MNPs.

In this research subjective measures of performance (financial and non-financial) have been used, because the availability and accuracy of objective data in SMEs are two main problems. Particularly the data those are associated with financial measures [45]. Furthermore, it is well documented that subjective performance measures are valid and reliable for founder reported performance measures [46-49].The term ''subjective measures'' refers to self-reported measures (Haber and Reichel, 2005). These measures include: growth in market share; growth in revenues (sales); growth in profitability; growth in number of employees, growth in quality of products and growth in customer satisfaction, in last three years of SMEs activities that are used as subjective (financial and non-financial) performance measures.

3. The research model

A review of literature revealed that there is a need for research designed to advance our understanding of the effect of SMP and MNon the performance on the part of small and medium-sized enterprises (SMEs). The input of marketing to the strategic planning process is found to be significantly associated with the performance of SMEs and marketing activities in successful SMEs are more structurally organized than in unsuccessful companies.

According to Siu et al [50], the higher performing SMEs display distinct marketing behaviours and the higher performing SMEs place marketing in the foremost position in corporate-planning. Besides, it has been widely assumed that SMEs owners/managers use networking in managing their marketing activities. Actually, networking activity is carried out mainly by the owners/managers (Gilmore et al., 2001) and may include his/her personal contact networks, business networks, industry and marketing networks [51], that is networking will be built around the owners/managers personality and activities.

Reviewing marketing networking literature and considering the convergent and overlap between some components of MNDs the researcher found four integrated dimensions of MNDs that are common among the previous studies (MNI, MNS, MNP and MND) (Hakimpoor et al, 2011).In addition SME owner-managers can utilize networking to support their marketing plans, refine and implement their marketing activities efficiently and eventually they can improve their firms' performance in a competitive marketplace (Gilmore et al, [13].Figure 1 shows the research model. Using neural network the researcher would be able to analyse the interactive effect of SMP and MNDs on the performance.

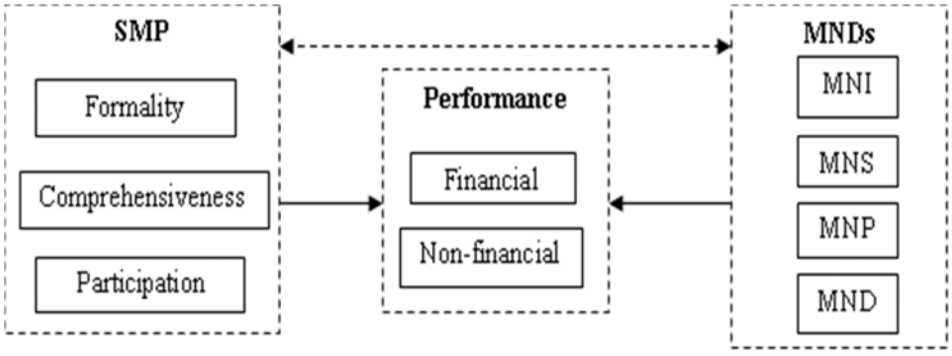

Figure 1: research model

4. RESEARCH METHODOLOGY

This study begins by sending an email to 2000 owners/managers in three states with the highest number of SMEs, Selangor, WP KL and Johor listed in 2011th Malaysian SMEs Directory. The owners/managers are surveyed as respondents, because, they have a significant impact on every aspect of the strategic and marketing activities of SMEs. Considering the control variables, the stratified random sampling method was used for gathering quantitative data, because the stratifying criterion help researcher to be ensure that the resulting sample is distributed in the same way as the population [52]. Two stratifying criterion were used in this study, namely size and type of industry. Size has two levels, small and medium. Type of industry includes 6 groups of SMEs that have the majority of them (75.8%) including, Textiles and Clothing; Metal and Non Metallic Mineral Products; Food Products and Beverages; Paper and Recorded Media; Furniture and Wood Products; and Rubber and Plastic Products.

The questionnaires were distributed between January to July 2012. The email describes the purpose of the survey and provides a link to the online questionnaire. The email was sent in three rounds. The first round generates 86 responses, followed by a reminder and 26 responses in the second round and finally 14responses in the third round giving a response rate of 6% or 126 respondents.It is not easy to get a high respond rate from the respondent in SMEs context. Considering some of the previous researches that have been conducted in Malaysian SMEs context (e.g. Hashim[53] with 100 respondents, Hashim et al.,[54] with 100 respondents and Sa'ari[55] with 150 respondents) the respondent number of this study was acceptable.

The majority of respondents have Malay and Chinese race (more than 90%) and the majority of the respondents are Male (66%). The sample was slightly dominated by respondents with 20-30 years old (38%) and 31-40 years old (24%). Approximately 70% of respondents are managers in their company. More than 62% of respondents had at least undergraduate degree. In this study, exploratory factor analysis (EFA) was used to test factorial validity. The results of EFA analysis revealed 13 factors with an Eigenvalue greater than one and no single factor explained a great amount of variance (i.e. variances ranged from 2.28% to 11.71%). This test confirmed the lack of significant systematic common method bias or variance in the data. Principal Components Analysis (PCA) has been used as the most common EFA procedure. Thus, a PCA/EFA analysis was conducted in SPSS 19.0 using collected data. Initially, KMO index (i.e. Kaiser-Meyer-Olkin measure of sampling adequacy) was 0.798 indicating adequacy of sample size for EFA test.

As shown in Appendix, the PCA analysis of main variables confirmed all items did align properly with their related theoretical constructs and thus satisfy three objectives of EFA as discussed previously. Convergent validity is the agreement among measures that are related theoretically. Item loadings, and average variance extracted values (AVE) are two methods to examine this validity. The AVE values of the variables, indicated in Table 2, are between 0.55 and 0.80, providing more proof for convergent validity. As suggested by Hair et al., (1998), all AVEs were above 0.5 indicating those constructs can explain high percentage of variance of the latent variable.

Table 1: AVE, CR, and Cronbach Alpha of the constructs

Construct	AVE	Composite Reliability	Cronbach Alpha
Formality	0.699	0.920	0.892
Comprehensiveness	0.704	0.904	0.859
Participation	0.801	0.923	0.877
MNI	0.625	0.869	0.800
MNS	0.631	0.871	0.818
MNP	0.601	0.949	0.942
MND	0.643	0.926	0.906
Financial performance	0.616	0.905	0.873
Non-Financial Performance	0.605	0.932	0.917

As is presented in Table 1, all variables have the CR greater than 0.70. Therefore, both Cronbach alpha and composite reliability suggest satisfactory level of construct reliability.

5.Modeling neural network

For developing an ANN model, the researcher needed factors such as data pre-processing, the determination of adequate model inputs and suitable network architecture, optimisation (training or learning) and model validation [56]. In addition, the selection of appropriate model inputs is extremely important in modelling ANN. In the latter, the architecture of the model has to be determined first, which is done with the aid of empirical or analytical approaches, before the unknown model parameters can be estimated.

Traditionally, feed-forward networks, where nodes in one layer are only connected to nodes in the next layer have been used for prediction and forecasting applications. For feed forward networks the most common learning algorithm is the back-propagation (BP) algorithm, a method of training artificial neural networks how to perform a given task [57]. The back-propagation neural network (BPNN) model is an advanced multiple regression analysis neural network model that is capable of dealing with more complex and non-linear data relationship than standard regression analysis (Phillips et al, 2001).

The next stage is determination of network architecture. It has been shown that an ANN with one hidden layer is suitable enough to impersonate all nonlinear performances given that sufficient degrees of freedom (i.e. connection weights) are provided (e.g. [58]. The number of model inputs equals the number of nodes in the input layer, whereas the number of nodes in the output layer is fixed by the number of model outputs. Accordingly, the seven factors that identified as inputs in the research model (i.e. formality, comprehensiveness, participation, MNI, MNS, MNP and MND) were used as inputs for neural network analysis and two factors that identified as outputs in the research model (figure 1) (i.e. financial performance (FPERF) and non-financial performance (NFPERF)) corresponded to outputs for neural network analysis.

The critical aspect in determination of network architecture is the choice of the number of nodes in the hidden layers and hence the number of connection weights (Maier and Dandy, 2000).The number of neurons in the hidden layer would vary for different applications and could usually depend on the size of the training set and the number of input variables. Three heuristic rules that are mentioned in recent references e.g. (Shariati et.al, 2012) were tried by this research and it was found that the optimal fit between inputs and outputs was achieved with a network with a single hidden layer of 5 nodes. The structure of ANN model that has been used in this research is visualized in Figure 2.

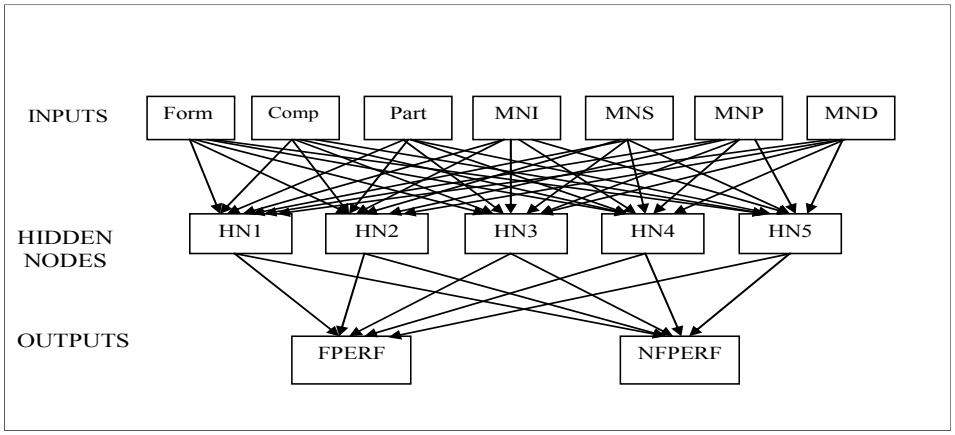

Figure 2: Architecture of research ANN model

6. Data analysis

The first stage in data pre-processing and data screening was treating missing data and outliers. Totally, 126 usable questionnaires were collected. In present study, of the total of 126 usable questionnaires, 29 questionnaires had missing data. Since the missing data for each construct was below two missing values, all questionnaires were retained in this stage. Thereafter, the researcher replaced missing values with the mean value of each variable as this is the most common method of missing data treatment among researchers [59].

The next stage in data screening process was detecting outliers. Outliers are cases that deviate so much from the other cases and lie outside of the general pattern of a distribution as to arouse suspicions that it was generated by a different mechanism [60].Data outliers, when found, should be removed or replaced. Its presence jeopardises neural network proper learning. Additionally a network trained with outliers will have an unpredictable behaviour when in the presence of real data. According to the output of box plots in SPSS, 5 outlier cases were identified and thus, were dropped from further analysis. Having 5 cases removed, 121 cases were retained for further analyses. The second stage in data pre-processing and data screening was testing data normality. Regarding in this study the mean squared error (MSE) function was used to optimise the connection weights in ANN models, the data need to be normally distributed in order to obtain optimal results (Maier and Dandy, 2000).

There are several general data processing algorithms that removed the undesired variances and enhanced the information content on data. One technique is normalisation which typically removes redundant information from a data set, compacting or making it invariant to one or more features. The principle of normalisation is to reduce a vector (or data set) to a standard unit length, usually 1. Furthermore it is necessary to re-scale all the inputs (normally between 0 and 1 or between −1 and 1). This is the required rescaling method for scale-dependent variables if the output layer uses the sigmoid activation function. In this research the sigmoid

activation function was employed because compared with the other activation function (i.e.Hyperbolic tangent function) sigmoid activation function had less sum of squares error (SSE). According to Guh [61]to scale the data for a particular input X:

$Scaled\ X = (X - min\ X) / (max\ X - min\ X)$

Data rescaling was done for all inputs in data set so that initially all the input variables had the same importance and during the learning phase the network deliberately altered the importance of variables, by changing the strengths of the connections between the input layer and the hidden layer.Finally the data set must be divided in two sets, a training set and a test set. In this research about 67% of data set (81) used for training the ANN and 33% of data set (40) used for testing and validation.

The next stage is the process of optimising the connection weights that is known as 'training' or 'learning'. The process was conducted by changing the weights of each connection (iteratively and simultaneously) to minimise the error between desired output and actual output. In this research the training was done in batch mod. Batch mode updates the synaptic weights only after passing all training data records; that is, batch training uses information from all records in the training dataset. Batch training is often preferred because it forces the search to move in the direction of the true gradient at each weight update and it directly minimizes the total error and is most useful for "smaller" datasets (Meier and Dandy, 2000). The performance of the model has been judged based on prediction accuracy. As a measure of performance, the Sum-Squared-Error (SSE) and mean-squared-error (MSE) between the real amounts of performance parameters and the estimated amounts (ANN outputs) were compared. This statistical criterion measures the total deviation of the response values from the fit to the target values. In this research the sigmoid activation function was employed in all layers because compared with the other activation function (i.e. Hyperbolic tangent function or linear function) and based on the Sum-Squared-Error (SSE) and mean-squared-error (MSE) as measure of performance, sigmoid activation function had less SSE and MSE (Table 2).

Table 2: network performance based on activation functions

Transfer (activation) Function / Items	Linear	Hyperbolic Tangent	Sigmoid
Sum-Squared-Error (SSE)	0.668	0.604	0.556
N (number of testing data set)	40	40	40
Mean-Squared-Error (MSE)	0.0167	0.0151	0.0129

The R_{sq} values also were calculated to evaluate the performance of the network model. R_{sq} is the amount of variance of dependent variable(s) that is "accounted for" or "explained" by the independent variable(s). In this study small and medium size (SMEs) companies were selected as sample frame. Regarding literature it was expected that the level of formality in strategic marketing planning in medium size companies is more than small companies [5, 7]. As it was expected the ANOVA analysis showed that there is a significant difference between small and medium size companies in terms of the formality of SMP ($p>0.5$). This finding reveals that the larger the size of company the more the potential for formal strategic marketing planning and it is consistent with previous research [7-8, 10]. In other word, the larger firms have higher potential for strategic marketing planning formally and it is reasonable because of lack of experts of strategic planning in small companies. Although, the ANOVA analysis did not show any significant difference between small and medium size companies in terms of comprehensiveness and participation in SMP ($p>0.05$). Regarding the variety of SMEs in Malaysia, a diversified set of them participated in this research. The ANOVA analysis did not show any significant difference between different groups of industries in terms of SMP dimensions, MNDs and performance ($P>0.05$).

Using MBP analysis, the model was examined in terms of a goodness-of-fit value (R^2) and the contribution of different input variables to neural network (input sensitivity analysis). The R^2 values were calculated by comparing the mean squared error (MSE) between desired output and actual output divided by the variance of the desired output (Table 3) and are similar to R^2 coefficients provided in multiple regression analysis [57].

Table 3: network performance based on R^2 values

Network outputs / Network performance	Financial performance (FPERF)	Non-Financial Performance (NFPERF)
R^2	0.54	0.56
MSE	0.0129	0.0129
RMS	0.1136	0.1136
Variance of Desired output	0.024	0.023
Note: RMS is root mean squared between desired output and actual output of network		

As can be seen in Table 3 the R^2 values obtained were 0.54 and 0.56 for two outputs financial performance and non-financial performance, respectively. Therefore, the model explains over 54% of the variance of the

perceived performance on financial performance and over 56% of the non-financial performance as output variables.

The next stage was determination of the contribution of different factors to the networks. The contribution of different factors to the network was determined by the magnitude of their weighted connections (positive or negative) to the hidden nodes (Table 4). Examination of the connections between hidden nodes and output nodes then showed the impacts which the hidden nodes (and thus their combinations of contributing factors) had on the performance output (Table 5).

The connections that signed positively at either stage, had an enhancing effect upon the hidden or output nodes, while negatively signed connections had an inhibitory effect [20].Observing the finding of the network, the fifth factor of the input layer (MNS) has the highest total contribution (3.750) to the five hidden nodes comprising the hidden layer. The second highest total contribution comes from the MNI factor (3.435), whereas the third node in input layer (participation) had the lowest level of the total impact of the hidden layer (1.022). According to the findings all marketing networking dimensions (MNDs) have high contribution to the network (3.750, 3.435, 3.015 and 2.225 for MNS, MNI, MNP and MND respectively). Among the SMP dimensions the formality had the highest total contribution to the network (2.267) and comprehensiveness and participation have the lowest total contribution to the network (1.183 and 1.022 respectively).

Table 4: Neural network topology on the linkage between main variables

Predictor		To the Hidden Layer					
		H(1:1)	H(1:2)	H(1:3)	H(1:4)	H(1:5)	Total contribution
From Input Layer	(Bias)	-.414	-.093	-.046	.091	.936	1.580
	Form	1.008	.125	.358	.206	-.570	2.267
	Comp	.058	-.422	.024	.438	-.241	1.183
	Part	.322	.054	.603	0.00	-.042	1.022
	MNI	1.023	-.584	.467	.605	-.756	3.435
	MNS	1.743	-.808	.176	.325	-.698	3.750
	MNP	1.274	-.337	.564	.267	-.573	3.015
	MND	.889	-.074	.240	.412	-.610	2.225

Table 5: Impact of hidden nodes on output nodes

	From the Hidden layer					
To the output layer	(Bias)	HN1	HN2	HN3	HN4	HN5
FPERF	-1.400	0.766	0.073	1.327	0.393	-1.748
NFPERF	-1.098	0.675	-0.827	0.769	1.138	-2.890
Total contribution	2.498	1.441	0.900	2.096	1.531	4.638

As can be seen in Table 4, the strongest impact derived from the input factors is directed to the hidden node 1. Three strong contributory weights stemmed from marketing networking dimensions (i.e. 1.743, 1.274, and 1.023 for MNS, MNP and MNI respectively) and a contributory weight to the hidden node 1 stemmed from formality (1.009). Two other input factors (participation and comprehensiveness) also have a contributory and positive weight (albeit small) on hidden node 1 (i.e. 0.322 and 0.058 for participation and comprehensiveness respectively). On the other hand hidden node 1 had contributory weight impacting all output measures (see Table 5 for impact of hidden nodes on output nodes) revealed that combination of SMP factors (i.e. formality, comprehensiveness and participation) and marketing networking dimensions (MNS, MNP, MNI and MND) have combination of contributing (positive) impact on the performance (0.766 and 0.675 for financial and non-financial performance respectively).

All the input factors have contributory effect on hidden nodes 1, 3 and 4. Hidden node 3 had three significant contributions from three input nodes (i.e. 0.603, 0.564, 0.467 and 0.358 for Part, MNP, MNI and Form respectively). Hidden node 4 received significant contributory effects from input nodes (0.605, 0.438, 0.412 and 0.325 for MNI, Comp, MND and MNS respectively). On the other hand nodes 3 and 4 have contributory weights impacting on all output measures (see Table 4 for impact of hidden nodes on output nodes). Hidden node 3 had a significant contributory weight on performance (1.327 and 0.769 for FPERF and NFPERF respectively) and hidden node 4 also had a positive contributory weight on performance (0.393 and 1.138 for FPERF and NFPERF respectively).

These findings can be interpreted as revealing the merged effects (combination of contributing factors) of "participation" and "formality" with MNP and MNI can have a positive impact on the performance and this impact is stronger on financial performance rather than non-financial performance whereas the merged effects of

"Comprehensiveness" with MNI, MND and MNS had a stronger positive impact on non-financial performance than financial performance (see Table 5).

Hidden node 2 received mixed impact (contributory and inhibitory) from input nodes and the highest inhibitory weights impacting on hidden node 2 made by MNS, MNI and MNP respectively. Since and after a subsequent stage of analysis on contributory and inhibitory weights for hidden node 2, it was detected that MNS, MNI, MNP and "Comprehensiveness" had a positive impact on non-financial performance (see table 4.22, the inhibitory weights on hidden node 2). In addition, the negative (inhibitory) impact of hidden node 2 on the non-financial performance (-0.827) has proved it (see Table 5).

All the input factors showed inhibitory weights on their correspondence with the hidden node 5. The highest negative impacts (inhibitory weights) belong to marketing networking dimensions and formality (see Table 5) and this hidden node (hidden node 5) showed a very high inhibitory (weight) effect on the performance (i.e. -1.784 and -2.890 for FERF and NFPERF respectively). These findings can be interpreted as that when the negative impact of marketing networking dimensions and SMP dimensions are merged together this will result to a very high negative impact on performance. It means that the companies who have higher level of SMP (formality, comprehensiveness, and participation) and at the same time have higher level of marketing networking will have higher level of performance and vice versa.

With regard to contributory weights (positive impact) and inhibitory weights (negative impact) of every input factor to the hidden nodes and also the effect of hidden nodes on the output nodes it can be revealed that the relationship between SMP and performance is non-linear and this relationship is stronger when the marketing networking in company is stronger. To have clearer results about the influence of each input variable and its contribution to the output, independent variable analysis by connection weight method was done in the next section.

6.1 Independent variable importance analysis

Importance analysis or input sensitivity analysis performs a sensitivity analysis, which computes the importance of each predictor in determining the neural network. The analysis is based on the combined training and testing samples. This method was used to determine the influence of each input variable and its contribution to the output. The larger the sum for a given input node, the more the importance of the corresponding input variable [62].The relative importance of a given input variable can be defined as:

$$RI = \sum_{H=1}^{h} (W_{I-H} W_{H-O})$$

Where RI is the relative importance of the input variable I, h is the total number of hidden nodes, W_{I-H} is the weight of the connection between input node I and hidden node H, and W_{H-O} is the weight of the connection between hidden node H and output node. As can be seen in Table 6, marketing networking dimensions (MNDs) and formality have the highest importance to the network and consequently highest influence to the output factors. Among the marketing networking dimensions MNS has the highest importance and consequently the highest effect on the network outputs.

Table 6: Input sensitivity analysis

Independent Variable Importance		
Factors	Importance	Normalized Importance
MNS	0.225	100.0%
MNI	0.164	73.0%
MNP	0.145	64.4%
Form	0.140	62.2%
MND	0.133	59.3%
Comp	0.109	48.5%
Part	0.085	37.8%

7. Conclusion

Result of analyses showed that SMP and MN have a positive effect on performance and this effect is stronger when SMP and MN dimensions are merged. In other words, SMEs owners/managers who have better marketing networking, the relationship between strategic marketing planning and performance in their companies is stronger. It means that having better marketing networking helps to SMEs owners/managers to have better strategic planning for their marketing activities and consequently have higher performance (financial and non-financial).Based on the neural network analysis, formality is an important factor among SMP dimensions that had significant contributory effect on the performance and provides additional empirical support for the important role of formality in SMP for SMEs performance. Although, considering the other factors effect, the formality contributory effect was higher when the level of the marketing networking dimensions was higher.

The results of this study showed that comprehensiveness is the second important factor among SMP dimensions that had contributory effect on the performance and this contributory effect was higher on the non-financial performance whereas the merged effects of comprehensiveness with marketing networking dimensions had a stronger positive impact on non-financial performance than financial performance. The neural network analysis also confirmed that merged effects (combination of contributing factors) of "participation" with MNDs can have a positive impact on the performance and this impact is stronger on financial performance rather than non-financial performance. Practically, this finding reveals that SMEs owners/managers who are equipped with better marketing networking would gain higher level of participation in strategic marketing planning from the other managers and employees in their organization and consequently they will have better performance.

Building on the results of this study considering the interactive effects of marketing networking dimensions and SMP dimensions, whenever the level of contributory weight (positive effect) of marketing networking intensity is higher the level of performance also is higher. Importance analysis or input sensitivity analysis also confirmed that MNDs (i.e. MNI, MNS, MNP and MND) have positive and significant relationship with performance (except for relationship between MND and non-financial performance). It means that SMEs owners/managers utilize marketing networking to have access to the social resources that implanted within a network and also to be informed of what happens in complicated markets and provides understanding of inter-organizational relationships in business-to-business markets and to networking with outside expert advisers and consequently increase the chance of success for the firms [13, 63]. In addition, considering the results of this study and same effects that MNDs had on SMP-performance relationship, confirmed that marketing networking dimensions cannot be separated entities and they have been shown to be inextricably linked.

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